Claims.

1. A suspension system for a vehicle with a chain driven rear wheel comprises;

i) a rear suspension assembly and chain driven transmission arrangement that offers very high levels of anti-brake lift and anti-squat and does so consistently through a large range of rear suspension movement;

ii) a front suspension assembly / steering system with a steering axis inclined in the side view at an angle of castor which intersects the ground in front of the centre of the contact patch, the front suspension assembly having a high degree of anti-brake dive; characterised in that

iii) the front and rear suspension assemblies are interconnected in such a way as to offer low resistance to anti-phase motion and higher resistance to in-phase motion.

002. A suspension system according to claim 1 characterised in that the rear suspension assembly comprises a trailing arm (12;42:60,62,68), a rear wheel (10) being mounted to the trailing arm (12;42:60,62,68) at the rearward end thereof by means of a hub (34), the trailing arm (12;42:60,62,68) being attached to a frame (14) of the vehicle by means of a pivot (16;46;66,72), such that the tension side of a chain (18) of the chain transmission, intersects a line interconnecting the centre of the wheel (10) and the axis of the pivot (16;46;66,72), at a point (24) intermediate of the centre of the wheel (10) and axis of the pivot (16;46;66,72).

3. A suspension system according to claim 2 characterised in that chain tensioning means (22) is provided to accommodate coupling between the rear suspension assembly and chain transmission.

4. A suspension system according to claim 2 or 3 characterised in that the rear wheel (10) has a hub mounted brake (40), a brake reaction lever (32) being attached to the hub (34), so that the hub (34) may rotate relative to

the brake reaction lever (32) as long as the brake (40) is not applied, a brake reaction link (30) connecting the brake reaction lever (32) to a point (36) on the vehicle frame (14), at a level above the axis of the pivot (16) between the trailing arm (12) and frame (14).

5. A suspension system according to claim 2 characterised in that the rear suspension and chain transmission are substantially de-coupled throughout the full range of suspension travel.

6. A suspension system according to claim 5 characterised in that a drive sprocket wheel (20) mounted on the frame is connected to a driven sprocket wheel (50) on the wheel (10), via an idler sprocket wheel (44;44';44''), the idler sprocket wheel (44;44';44'') being positioned such that the length of chain (18) under tension between the drive sprocket wheel (20) and idler sprocket wheel (44;44';44'') and, between the idler sprocket wheel (44;44';44'') and driven sprocket wheel (50) will remain substantially constant, throughout the full range of suspension travel.

7. A suspension system according to claim 6 characterised in that the idler sprocket wheel (44) is mounted on the trailing arm (42), the point at which the length of chain (18) between the drive sprocket wheel (20) and the idler sprocket wheel (44) first contacts the idler sprocket wheel (44), coincides with the axis of the pivot (46) between the trailing arm (42) and frame (14).

008. A suspension system according to claim 6 characterised in that the idler sprocket wheel (44') is mounted on the frame (14), the length of chain (18) between the idler sprocket wheel (44') and the driven sprocket wheel (50) passing through the axis of the pivot (46) between the trailing arm (42) and frame (14) through the full movement of the trailing arm (42).

9. A suspension system according to claim 6 characterised in that the wheel hub (34) is mounted on a hub carrier (60), the hub carrier (60) being mounted to the frame (14) by means of a pair of trailing arms (62,68), the trailing arms (62,68) converging towards the frame (14), the axis of the length of chain (18) between the idler sprocket wheel (44) and the driven sprocket wheel (50) passing through the point of intersection (V) of the axes of the trailing arms (62,68).

10. A suspension system according to any one of claims 7 to 9 characterised in that chain tensioning means (48) is provided in the length of chain (18) from the driven sprocket wheel (50) to the drive sprocket wheel (20).

11. A suspension system according to any one of claims 7 or 9 characterised in that first and second idler sprocket wheels (44'') are drivingly interconnected, one idler sprocket wheel (44'') being drivingly connected to the drive sprocket wheel (20) by a first chain (18') and the other idler sprocket wheel (44'') being drivingly connected to the driven sprocket wheel (50) by a second chain (18'').

12. A suspension system according to any one of claims 6 to 11 characterised in that chain (18;18'') between the idler sprocket wheel (44;44';44'') and the driven sprocket wheel (50) has an angle to the horizontal, in side elevation of from 25 to 50 degrees.

13. A suspension system according to any one of the preceding claims characterised in that the front suspension assembly comprises a fork assembly (70), the fork assembly (70) being connected at its upper end to a steering assembly (72,98) by means of an upper wishbone (74) and, intermediate of its ends, to a frame (14) by means of a lower wishbone (76), in a manner which will allow the transmission of steering movements to the fork assembly (70); a front wheel (84) being rotatably connected to the lower end of the fork assembly (70) by means of a hub (34), the front wheel (84)

having a hub mounted brake (40), a brake reaction lever (90) being attached to the hub (34), so that the hub (34) may rotate relative to the brake reaction lever (90) as long as the brake (40) is not applied, a brake reaction link (92) connecting the brake reaction lever (90) to the upper wishbone (74), the connection (82) of the fork assembly (70) to the upper wishbone (74) being intermediate of the connections (80,96) of the upper wishbone (74) to the steering mechanism (72,98) and of the brake reaction link (92) to the upper wishbone (74).

14 A suspension system according to any one of the preceding claims characterised in that the front and rear suspension assemblies are interconnected by means of a balance beam (104;144), the balance beam (104;144) being connected at a forward end to the front suspension assembly and at a trailing end to the rear suspension assembly, such that for in-phase motion the front and rear suspension assemblies will apply a load to the balance beam (104;144) in the same direction and for anti-phase motion the balance beam (104;144) will pivot about a point intermediate of the forward and trailing ends so that a load applied to the balance beam (104;144) by one of the front and rear suspension assemblies will be transmitted to the other of the front and rear suspension assemblies, in the opposite direction.

15. A suspension system according to claim 14 characterised in that a pair of spring/damper units (112,114) act between the frame (14) and the balance beam (104;144), the spring/damper units (112,114) being connected to the balance beam (104;144) at axially spaced locations (118), whereby for in-phase motion both spring/damper units (112,114) will be in compression, while for anti-phase motion, one spring/damper unit (112,114) will be in compression while the other spring/damper unit (114,112) extends, the balance beam (104;144) pivoting about the connection (118) thereof with the spring/damper unit (112,114) under compression.

16. A suspension system according to any one of claims 1 to 13 characterised in that the front and rear suspension assemblies are interconnected by a balance lever (154), the front and rear suspension systems being connected to the balance lever (154) by means of first and second spring/damper units (150,160) and a third spring/damper unit (164) acting between the balance lever (154) and vehicle frame (14), the third spring/damper unit (164) biasing the balance lever (154) to a neutral balance position, the front and rear suspension assemblies being connected to the balance lever (154) such that; for in-phase motion first and second spring/damper units (150,160) will be compressed, the balance lever (154) being retained in its neutral balance position by the third spring/damper unit (164); and for anti-phase motion the first and second spring/damper units (150,160) act as a substantially rigid link, the balance lever (154) pivoting against the third spring/damper unit (164), so that a load applied to the balance lever (154) by one of the front and rear suspension assemblies will be transmitted to the other of the front and rear suspension assemblies, in the opposite direction.

17. A suspension system according to any one of claims 1 to 13 characterised in that plungers (172,182,186,192) attached to the front and rear suspension assemblies are interconnected by a cage (174), first and second spring means (180,190) acting between heads (182,192) of the plungers (172,182,186,192) and adjacent inner ends of the cage (174), and further spring means (176,188) acting between the cage (174) and the vehicle frame (14), to bias the cage (174) to a neutral balance position, whereby; for in-phase motion the first and second spring means (180,190) will be compressed, the cage (174) being retained in its neutral balance position by the further spring means (176,188); and for anti-phase motion the load applied to one of the first and second spring means (180,190) by movement of the suspension assembly, causing the cage (174) to move from its balance position against the restoring force applied by the further spring means (176,188), so that a load applied to the cage (174) by one of the

front and rear suspension assemblies will be transmitted to the other of the front and rear suspension assemblies, in the opposite direction.

18. A suspension system according to any one of the preceding claims characterised in that means (206;236) is provided for adjustment of the interconnection, to selectively alter the pitch attitude of the vehicle.

19. A suspension system according to any one of the preceding claims characterised in that means (230,240,246) is provided for adjustment of the interconnection to selectively alter the suspension height.

20. A front suspension assembly for a vehicle comprising a fork assembly characterised in that the fork assembly (70) is connected at its upper end to a steering assembly (72,98) by means of an upper wishbone (74) and, intermediate of its ends, to a vehicle frame (14) by means of a lower wishbone (76), in a manner which will allow the transmission of steering movements to the fork assembly (70); a front wheel (84) being rotatably connected to the lower end of the fork assembly (70) by means of a hub (34), the front wheel having a hub mounted brake (40), a brake reaction lever (90) being attached to the hub (34), so that the hub (34) may rotate relative to the brake reaction lever (90) as long as the brake (40) is not applied, a brake reaction link (92) connecting the brake reaction lever (90) to the upper wishbone (74), the connection (82) of the fork assembly (70) to the upper wishbone (74) being intermediate of the connections (80,96) of the upper wishbone (74) to the steering mechanism (72,98) and of the brake reaction link (92) to the upper wishbone (74).

21. A suspension assembly according to claim 13 or 20 characterised in that the fork assembly (70) is connected to the upper wishbone (74) by means of a pivot (82) which allows pivotal motion about an axis parallel to the axis of rotation of the wheel (84), while permitting some angular compliance in a plane at right angles to the axis of the fork assembly (70).

22. A suspension assembly according to claim 13 or 20 characterised in that the fork assembly (70) is connected to the upper wishbone (74) by a universal joint (82), the axis of the universal joint (82) being coaxial with the axis of the fork assembly (70).

23. A suspension assembly according to claim 21 or 22 characterised in that the fork assembly (70) is connected to the lower wishbone (76) by a spherical joint (88).